# FORECASTING FOR PLANNING

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Prepared for:

Advanced Research Projects Agency

30 June 1973

UNCLASSIFIED

Security Classification

AD 764 956

## DOCUMENT CONTROL DATA - R & D

*(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)*

1. ORIGINATING ACTIVITY (Corporate author)
Project for Theoretical Politics
The Ohio State University
053 Administration Building

2a. REPORT SECURITY CLASSIFICATION
UNCLASSIFIED

2b. GROUP

3. REPORT TITLE
"Forecasting For Planning"

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)
Research Report # 2

5. AUTHOR(S) (First name, middle initial, last name)
Warren R. Phillips

| 6. REPORT DATE | 7a. TOTAL NO. OF PAGES | 7b. NO. OF REFS |
|---|---|---|
| June 30, 1973 | 57 | 50 |

| 8a. CONTRACT OR GRANT NO | 9a. ORIGINATOR'S REPORT NUMBER(S) |
|---|---|
| DAHC15 73 C 0197 | # 2 |
| b. PROJECT NO: A.O. 2345-3D20 | |
| c. | 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) |
| d. | |

10. DISTRIBUTION STATEMENT
This document has been approved for public release and sale; its distribution is unlimited and production in whole or in part is permitted for any purpose of the United States Government.

| 11. SUPPLEMENTARY NOTES | 12. SPONSORING MILITARY ACTIVITY |
|---|---|
| | Advanced Research Projects Agency<br>Washington, D.C. |

13. ABSTRACT

This paper explores the potential utility (role) of forecasting for foreign policy planning and decision making. To this end, an attempt is made to delineate a formal specification for the decision making process in foreign policy bureaucracies and to use that delineation to evaluate the role of forecasting in policy planning. The types of decision processes that occur at various levels in the decision process and the set of planning requirements at each of these levels are delineated. Against the set of planning requirements, the various forecasting strategies are received. From this review it is apparent that forecasting serves as a potentially valuable source of prediction input to the process of making plans and decisions. Moreover, forecasting emerges as a primary area of potential cooperation between theorist and practitioner.



DD FORM 1 NOV 68 1473

UNCLASSIFIED

Security Classification

| 14. KEY WORDS | LINK A | | LINK B | | LINK C | |
|---|---|---|---|---|---|---|
| | ROLE | WT | ROLE | WT | ROLE | WT |
| Forecasting | | | | | | |
| Planning | | | | | | |
| Decision Process | | | | | | |
| Hierarchical control system | | | | | | |
| Forecasting techniques | | | | | | |

# FORECASTING FOR PLANNING

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Paper prepared for delivery at the ISA Meetings in New York, March 13-17, 1973, to appear in Hilliker (ed.) Knowledge and Diplomacy: The Interaction of Research and Foreign Policy, forthcoming.

Prepared in connection with research supported by the Advanced Research Project Agency, ARPA Order No. 2345-3D20 Contract No. DAHC 15 73 C 0197, RF 3527-A1.

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# Forecasting for Planning

By whatever name--forecasting, prediction, projection, estimation, or anticipation--this activity goes on constantly in the process of foreign policy decision making. Forecasting usually involves the use of images of how the environment, be it of nations, organizations, or individuals, operates to produce: estimates of probable occurrences, series of alternative futures, the impact of given actions, or the future direction of some process. In many instances the activity of forecasting is not explicitly stated, but it is fairly easy to infer from policy justifications. For instance the statement, "we must meet Communist agression wherever it occurs," has the implication that the Sino-Soviet Bloc is likely to attack other countries with military force in the future. Or the assertion, "if Israel's military capabilities decline, the Arabs will attack," is an expectation of the Arab state's decision process. An assertion of the nature, "our energy needs by the year 2000 will be difficult to acquire," is based on the assumption of the trends in our use of energy as well as trends in the supply of natural resources.

While forecasting has been allocated a discrete chapter in this book, it is tightly intertwined with goal setting, data collection, and model building. The government formalizes short range forecasting through the device of intelligence estimates (NIE's) which purport to define a range of probabilities within which policy making can operate with some assurance. The estimates proceed decisions about US actions in a particular issue or arena and are the coalition of data available and images of how a particular issue is likely to develop. The Inner Services Committee on Long Range Forecasting has as a principal goal the integration of forecasting for planning activities throughout the various services of the

Defense Department. Such documents as the Joint Chiefs of Staff's (JSOP, and JLRSS) are based upon formal and informal estimates of the future environment in which U. S. foreign policy is expected to be effective.

The policy process in which these plans become operational is dominated by negotiation and bargaining in which organizational as well as personal influence and power are often more persuasive than the substance of the policy problems. We can identify in this decision arena, several forms of policy planning which are admittedly subject to bureaucratic politics but are also representative of the types of planning which rely heavily upon forecasting.[1]

1. Contingency Planning: This first type of planning--contingency planning--is based upon scenarios of possible crises with which the United States is likely to be faced in the future. Preparing operational plans for these possible eventualities enables policy makers to analyze the effects which crises would have upon the current stability of international relations and speculate upon the most effective responses. While contingency planning is a useful exercise in that it enables policy planners to identify potentially harmful or dangerous situations and relevant actors who are likely to be involved, were these situations to come about, it is of limited usefulness because domestic political contexts in which decisions must be made to predict and also because the scenarios foreseen in the plans are seldom duplicated in real crises.

2. Program Planning: This form of planning occurs regularly in agencies like USIA, AID, Peace Corps, parts of the State Department and Defense Department which carry out programmatic activities and where planning can be accomplished without frequent and major interference by forces outside the United States control. Program Planning tends to idealize a non-political criterion--efficiency--as opposed to a political one--consensus. Its greatest potential seems to be recognized in the Defense budget cycle which involves a complicated series of programs and weapons systems all of which require the long run allocation of measurable resources. This form of planning attempts to institutionalize the process of foreign policy planning. Most of the detailed planning of this nature is under the exclusive control of the executive agencies. Congress does not seem to have the resources or facilities available to duplicate this effort at the current time.

3. Country Analysis and Strategy Planning: This form of planning is most actively pursued in the State Department from which the title actually comes.[2] It is the antecedent of PARA and is a planning document developed by the operators from country teams abroad to assist Assistant Secretarial levels and above in Washington. Country analysis and strategy papers identify U. S. goals and objectives in individual countries, project U. S. levels of concern and discuss courses of actions which American foreign policy should take to meet our goals in each specific country.

4. Issue Research: This is the final form of planning. It is less formalized than the country analysis and the strategy papers are more

directly relevant to specific policy problems facing U. S. decision-making. Most issue analysis is performed by policy officers as a potent vehicle of advocacy in an issue oriented department. It tends to be in response to requests from higher officials to produce a policy paper which will enter into the bargaining processes across governmental agencies in an attempt to predict future events associated with a specific issue such as likely positions of other nations at the CCD meetings and recommend specific U. S. action with regard to such an expectation.

The following examples and discussion of planning activities requiring forecasts point out that forecasting is predecision in nature. It is usually the case that expectations of how the system works and what the reactions of other nations are likely to be to U. S. initiatives become inputs to the decision process. They are taken into consideration in some decisions more seriously than others, and in some issues more formally than others before decisions are reached. In general it can be asserted that there is a lack of explicitness in the forecasting for planning.[3]

In order to make sense of the complex environment in which U. S. foreign policy is developed, planners use various tools to organize and order their experience. One of these tools is the model--a set of elements together with the relations defined upon them. A model may be of many types, e.g., physical, mathematical or mental. A mental model or image is simply an abstraction of various aspects of perceptual experience. For example a decision maker might have a mental model of how decisions are made in Brazil. He would then use this image in evaluating the potential impact of alternative U. S. policies toward

that country. These mental models or images are frequently relied upon. There are major problems associated with this form of modeling, however. For example, decision makers have many different mental images each dealing with a wide range of overlapping problems, and each, frequently, inconsistent with the others. Planners are faced with difficulties in knowing which images are applicable in a specific case. Since the relationships in each image are not explicitly and clearly identified, the sources of contradiction are not immediately obvious. Policies made upon the basis of such images of the world are likely to have unintended and often undesirable consequences.[4]

In addition, the lack of explicitness in mental images makes it difficult to communicate the assumptions upon which strategy preferences are based. In these cases disputes about policy alternative or outcomes may actually result from unidentified disagreements concerning the implications of actions. Perhaps more importantly from a long range planning perspective, it is difficult to manipulate the variables in mental images in order to assess the various impacts of U. S. actions. That is, the complexity of social phenomena makes it almost impossible to move from a vague set of assumptions about the world through the dynamic consequences these assumptions have for the impact of various policy alternatives.

Unfortunately, the obstacles to planning have been especially profound in foreign affairs. Neither the political process nor the foreign affairs bureaucracy has encouraged a serious consideration of long range problems. Moreover, the practitioner's firm convictions that international events are

inherently unpredictable has provided additional support for the belief that planning is doomed to failure: events cannot be foreseen and must be dealt with as they occur. But this argument is misleading for three reasons: point prediction is not a good criteria, the predictions may cause self correcting activity which prevents the expected occurrence, and forecasting of an intuitive nature goes on daily by those very people who would distain the effort. The last point has already been amply demonstrated.[5]

In the first issue, attempts to plan for the future may not require specific predictions of the occurrence of an event but may rely upon the forecasts of impact of a strategy upon the flow of events. In this case, the criteria of an accurate measure of the liekly impact of a particular choice among alternative strategies is more important than the prediction of specific events. In the second case, the forecast of future events fails to come true because it was made. These self defeating forecasts arise from rational acts on the part of people who make and believe the forecasts. As an example, predictions were made in the 1950's that the U. S. would be faced with a shortage of scientists and engineers. This prediction led to a change in the pattern of enrollments in graduate schools which obviously negated the prediction. The point to be made at this time is that predecision agreements over the validity of a forecast are not a good measure of its value. A more appropirate measure of value is its utility in helping the decision-maker make a correct and timely decision.

The concept of using a forecast as decision information has already been introduced. The cycle of activity of a foreign policy organization has been identified in earlier chapters and stages in this cycle performed the function of identifying chapter titles. The forecast serves as a predicion input to the process of making plans and decisions. As argued above the utility of a forecast

is measured by its potential roles in the planning and decision processes. Lenz has expressed the role of the forecast in planning as follows:

a. The forecast identifies limits beyond which it is not possible to go.

b. It established feasible rates of progress, so that the plan can be made to take full advantage of such rates. It does not demand an impossible rate of progress.

c. It describes alternatives which are open and can be chosen from.

d. It provides a reference standard for the plan. The plan can thus be compared with the forecast at any point in time, to determine whether it can still be fulfilled or whether, because of changes in the forecast, it has been changed.

e. It furnishes warning signals, which can alert the decision-maker that it will not be possible to continue present activities.

In performing each of these functions, the forecast provides specific pieces of information needed by decision-makers and planners.

Done well, planning could be of great practical significance. It would provide the criteria by which present choices can be worked through. Forecasting, the backbone of planning, is a primary area of potential cooperation between theorist and practitioners. Rothstein argues:

"This means that the failures of planning cannot be attributed solely to the imperfections of practitioners and the practical world. Some responsibility must fall on those social theorists who believe that any professional involvement with practical matters is intrinsically wrong and must be avoided. Since planning is an intellectual exercise--directed at very practical ends--which cannot be carried out in isolation from the analytical skills of the theoretical realm, the attempt to isolate theorists from practitioners dooms planning. The few practical men who

might be so inclined to plan lack the tools to do it well, and the few theoretical men who might be so inclined lack either the opportunity or the incentive." (1972, pp. 10-11)

The social sciences represent as yet a largely untapped resource with utility for planners in forecasting. An effort to bring the techniques and the substantive knowledge of the social sciences to bear on these problems should be worthwhile because:

1. The problems in planning and forecasting are so important that those charged with these tasks should draw upon a wide ranging set of intellectual resources, not only ranging widely across topics but delving deeply into critical problem areas which appear to be relevant.
2. The nature of scientific development is that it is cumulative, the knowledge gained in the past five years has added considerably more to the warehouse of knowledge than the ten years before that. In this respect, the previous five years has seen substantial support for basic research. It is now appropriate to use this information in applied, mission oriented projects.
3. The advances in the social sciences include not only substantive material but new methods and techniques, as well. These techniques include methods of forecasting outcomes of given actions or ranking a set of strategies against a list of desired outcomes in terms of effectiveness.
4. There is a growing interest on the part of policy oriented social scientists in practical problems. Their contributions can include analytical skills, basic research knowledge, experience with data retrieval systems, and the capability to assess current sources of information used by planners and forecasters. The interest of

this group of essentially problem solvers becoming involved, directly, with planners and forecasters provides a renewed hope for useful exchanges between scientists in the academic community and users.[6]

The development of an open dialogue between policy planners and social scientists on the roles and functions of forecasting should provide a series of gains to foreign policy decision-making.

1. More applicable scientific knowledge in the fields of planning and forecasting especially in the form of analytically assessing the impact of U. S. strategies with regard to a specific set of issues could be developed.[7]
2. More extensive experience in bringing policy users and academics together to work on practical problems should provide academics with more cognitive complexity in differentiating the world of public decision-makers, thereby insuring more specific assistance in the future. It should also give users an ability to use scholars more effectively in the future.[8]
3. The results of such an exchange should identify areas where more basic research is needed by policy planners. The weak points identified in such exchanges would become the rationale for further research which could be used as needed by forecasters.[9]

Having given away my prejudices in the early introduction of this chapter, it is now the task of showing how and where such scientific knowledge is applicable. Recent attention in theory and research on the bureaucratic handling of foreign policy questions has focused upon dealing with problems of knowledge usefulness in policy decision-making, transfers of knowledge to action, criticizing policy, and describing governmental behavior. Finding a mutually agreeable

approach to understanding the bureaucratic decision-making apparatus is difficult, however. Allison has underscored this problem: ". . . bureaucracy is the least understood source of unhappy outcomes produced by the U. S. government. Calls for the elimination of bureaucracy are, however, non solutions. Large organizations that function according to routines, and politics among individuals who share power, are inevitable features of the exercise of public authority in modern society." (1971, p. 266)

For our purposes a simple classification of the actors in foreign policy decision-making processes should suffice. Figure I presents a simple designation of the foreign policy decision-making actors. The essential characteristic of this process is that it is a multi-agency decision process. It is claimed that President Truman had a sign on his desk which read, "The Buck Stops Here." In our delineation of the multiple actors in foreign policy making, the President and his staff along with the National Security Council and the verification panels are the highest unit of decision-making.[10]

From his vantage point, the President has a unique perspective on foreign policy making. His responsibility is to view the total picture of both domestic and foreign affairs. The national political responsibilities at this level are most likely to be affected by personal idiosyncracies. The President's own style of politics and his personal style of decision-making affect in significant ways the roles that other players in this system are likely to perform. Under President Nixon's guidance it would appear that he prefers quite strongly to manage foreign affairs from this perspective. Kissinger's reluctance and refusal to bring Congress and the rest of the administration into the process reflects Nixon's desire to control the foreign policy from the White House. From this

perspective an overall rationality for the whole system must be developed. This rationality is neither associated with nor necessary for the other major levels in the policy-making process.

At the second level of actors, I have grouped together Stemple's senior political officers and managers in each of the five major foreign policy agencies: The Department of State, the Office of the Secretary to Defense, the Joint-Chiefs-of-Staffs, the Arms Control and Disarmament Agency, and the Central Intelligence Agency. The men in charge of these agencies manage sizable bureaucracies and their responsibilities to these specific institutions influence their goals and perspectives in quite different ways than goals developed at the higher level. The major impact and responsibility of these men is the coordination of the directives from National Security Council and the President with the information needs of the working level policy makers. Managerial level personnel actually control the work of the government in foreign affairs. They are the link between working bureaucracy and Presidential or senior political officers. Hillsman asserts:

> "Significant items of foreign policy cannot be managed at a lower level than a member of the administration, a man who is appointed by the President and who is therefore in a position at least to begin to inject into policy the broad political considerations . . ." (1971, p. 34)

Below this level are the working level policy makers. These personnel draft papers, clear them with other agencies, present them to higher levels, and control the amount and quality of information which is communicated up the hierarchy. Their information and organizational knowledge is considerably higher in technical questions of what is the host country doing today, or what is the current capability of the Israeli air force. They do not hold major

responsibility for questions of value. These questions are the main domain of the Presidential level and the senior political officers. This group includes desk officers in regional bureaus at the State Department, functional specialists and all office directors in all agencies. They probably have more leverage than an organizational chart of this nature would lead one to suspect, since they often control the information which is passed up the hierarchy.

John Stemple has summed up the essential aspects of this chart.

> "Each of the four levels play a distinct role in the policy decision-making process. Indeed, the Presidential level participates only in a few, select policy decision efforts. There is some support in the literature that decisions are made at the managerial level, and these constitute well over half of the policies and decisions the government deals with. However, the greater either the perceived difficulty of the problem or the threat, the more likely higher levels are to become involved. The process might begin with the Presidential perception of threat, and the problem works its way down the organizational chain. In other instances, probably the majority, problems well up from below, the presidential or senior level political control has to be exercised over a problem already contextually recognized and defined." (1972, p. 61)

Perhaps an example of how this system works in the forming of goals and courses of action can be seen in the recent SALT strategy. After Nixon came into the White House, an initial decision had to be made on whether or not to proceed with the arms control negotiations which were initiated by President

Johnson. This decision was reached in the White House itself. Once the decision was made, studies were requested from each of the five agencies laid out in the flow chart. An agency control panel in the National Security Council was designated as the coordinator and arbitrator for this task.

Each of the agencies were asked to draft, redraft and debate the issues that they saw in a potential SALT agreement. In addition to this, study channels of informal, ad hoc working groups were set up across agencies to hammer out compromises and inter-agency disagreements. When disagreements existed, multiple positions were presented to the National Security Council whose job it was to return drafts to the agencies after having decided on specific positions which had usually been presented as options in the inter-agency papers.

In this system it can be seen that each of the five agencies acted as adversary teams in which supervision and management was supplied by the National Security Council. As the process developed, a lead agency was assigned to coordinate our negotiating efforts. This agency was the Arms Control and Disarmament Agency with the director, Gerald Smith, appointed head negotiator. While Smith and his supervisory personnel could and did call upon working level assistance from across the agencies, ACDA's responsibility was to manage and coordinate the efforts in negotiation. Thus, in this instance the channeling of alternative options was an upward process from the five agencies themselves.

The designation of specific goals was then recommunicated down the system from the President or the National Security Council and major responsibility for coordination was vested in the Arms Control and Disarmament Agency whose responsibility became managing the working level people involved in SALT. Their responsibility also included the orchestration of the foreign policy process

surrounding the SALT negotiations. They had responsibility to coordinate public relations, negotiation, information to allied nations and communication backup for the decision-making process. This system which seems to have worked so well in the SALT negotiations appears likely to be employed more and more frequently in major foreign policy issues. It is an attempt to develop an inherently bias-free form of decision-making. It seems to provide each of the agencies essentially equal opportunity to present opinions. But it is a slow process, requiring a good deal of lead time which is not always available. In other instances the amount of interaction between the five agencies is much less well coordinated or developed.

The principal reason for policy decision failures in this system appears to be organizational ineffectiveness stemming from an inappropriate handling of knowledge which leads eventually to unsatisfactory policy. Edward Morse states the case succinctly: "Channeling and handling information has become an organizational problem no foreign ministry has mastered." (1970, p. 386)

The United States experience in recent years suggests that the relationship between foreign policy decision-making on the one hand and the information collecting and forecasting on the other is an integral aspect of effective organizational performance. The process suggests that there are patterns of behavior which are strongly influenced by organization position and expectations. Hilsman (1971), for instance, describes organizations in terms of the network of interpersonal relations at various levels. There seems to be a recognized agreement between policy makers and academics on the existence of levels of behavior, on the interaction of motivation and goals, and of the impact of forecasts on preferred modes of action at different levels of the policy process. Some of the elements of these concerns can be made explicit if we introduce modern systems theories which seek to treat organizations as hierarchical

multi-level systems. The concept of a multi-level, hierarchical structure cannot be defined by short, succinct statements. What we propose to do at this point is to (1) introduce some basic concepts for classification and study of hierarchical systems in general, (2) provide a conceptual foundation for the problem of coordination, and (3) indicate some features of hierarchical systems which make them attractive for use in the study of foreign policy decision-making.[11]

To begin with, the total system can be designated as the simple schematic in Figure I plus the ongoing process of foreign policy inputs and outputs (see Figure II). The operation of a subsystem on any level is influenced directly and explicitly from the higher levels, mostly from the immediately superseding level. This influence, while not always binding, tends to reflect a priority of importance in actions and goals of the higher levels. This influence will be termed intervention. The priority of action is oriented downward in a command fashion, but the success of the overall foreign policy system and indeed of the units on any level depends upon the performance of all units in the system. Since the priority of action tacitly assumes that intervention precedes the actions of lower units, the success of the higher units depends upon that action or the resulting performance of the lower level units. Performance can be viewed, therefore, as a feedback and response to intervention. Feedback is oriented upward as shown by the upward arrows in Figure II. We have termed these upward arrows the performance feedback channels. Each of the layers that we have laid out can be broken down into functional decision hierarchies.

The functional hierarchy should contain three layers as shown in Figure III. The lowest level, the selective level, accepts the information from outside the

unit and applies a decision algorithm to derive a course of action. The algorithm must be defined as an organizational means of reaching a solution to a specific intervention from above.

The inherent goal of the second layer activity, the learning and adaptation level, is to reduce uncertainty. Given a set of priorities and goals and the importance of actions from a higher level, this learning or adaptation layer must decide how to respond to the needs prescribed from above. This layer must reduce the uncertainty in making responses and initiatives as much as possible providing a simplified job for the selection level.

The self-organizing layer must select the structure, functions and strategies which should be used on the lower layers so that an overall goal or set of national interest can be pursued as closely as possible. It can change the directions for action of the first level if the overall goal is not accomplished, or it can change the learning strategy used on the second layer if the estimation of uncertainties turns out to be unsatisfactory.

We can formalize the coordination of activities at this point. Consider the process P. It has two inputs: a control of intervention input from the second level (m from a given set M) and an input $\omega$ from a given set $\Omega$, called the input. It also has an output y in a given set Y. The process P is assumed to be a mapping.

$$P: \quad M \times \Omega \rightarrow Y$$

Looked at in foreign policy terms the process or selection level concerns the working out of daily actions in each of the bureaucracies involved in foreign policy. The tasks here are to apply an algorithm for responding to stimuli from the environment which has been provided by the second level. While it is true that some policy is made in the "cables" these changes in the algorithms for

responding must be in harmony with the general outlines of objectives passed down from above or there is likely to be requests for a change in activity.

Next consider the second level in our control system. It has two inputs: coordination $\gamma$ provided by the higher level from a given set $\Gamma$, and the feedback $z$ from a given set $\xi$ coming from the process. The output is the control intervention $m$ selected from the set M. The system is a mapping:

$$C_i : \Gamma \times \xi_i \rightarrow M_i$$

At a managerial level the task of coordinating the organizing goals of the Administration with the realities of the daily routine must be carried out. It is here that decisions about the feasibility of particular plans is decided. These levels must provide policy plans for operators to use as algorithms in acting. It is the general case that this level must suggest plans, get them accepted by the Administration and implement them at the selection level.

The highest level is charged with the responsibility of coordination. It has only one set of inputs, namely the feedback information $w$ from the second levels which it uses to arrive at the coordination output $\gamma$. The system is assumed to be a mapping:

$$C : W \rightarrow \Gamma$$

where W is the set of feedback information inputs $w$. Except in rare instances, such as crisis, the Administration level sets national interests, chooses a policy plan or combines suggestions of several plans from the managerial level and assigns responsibility to a lead bureau at the second level, but it does not involve itself in the process directly.

To complete the description of this system we must specify the nature of the feedback information. The feedback information $z_i$ to the second level contains direct information on the process P; it is therefore a function of the control m, the disturbance $\omega$ and the output y, given by the mapping:

$$f_i : M \times \Omega \times Y \rightarrow \xi_i$$

Similarly the feedback information received by the highest level contained information concerning the behavior of the second level and is therefore assumed to be given by a mapping:

$$f_o : \Gamma \times \xi \times M \rightarrow W,$$

which is a function of the coordination y, feedback $\xi$ and output m.

It should be pointed out that this functional hierarchy is based on the conceptual recognition of the essential functions in a complex decision system. It provides only a starting point for a rational approach to assign proper functions to different layers. In fact, each functional layer can be implemented by further decomposition. For our purposes it is only essential to lay out the elements of the decision-making process and to borrow this functional hierarchy of levels or tasks so that we can demonstrate at what place a specific form of forecasting might be beneficially used. In order to do this, we need to make a set of assertions about the types of planning that each of these levels in a hierarchy must normally concern.

In spite of several common features the tasks and roles of the systems can be delineated by levels at this point.

1. A higher level unit is concerned with the larger portion or broader aspects of the overall foreign policy behavior. In hierarchical

systems terms this is reflected in the fact that a higher level unit is superior to two or more units and the decision of the higher level coordinates the lower levels in accordance with the goal or objective defined over the domains of all the units subordinate to it.

2. The decision period of a higher unit is longer than that of lower units. Simply put, the lower level units are responsible for today's decisions, whether to respond to previous actions or to initiate new actions. The time frame of these decisions are quite limited. However, to evaluate the effect of coordination, higher levels cannot act more often than the lower levels, whose behavior is conditioned by this coordination. Therefore, it is essential to recognize inherent differences of the time frames in most decisions as we proceed up the decision hierarchy. Certainly there are specific strategies or issues such as the Cuban Missile Crisis when the normal process is short-circuited by making most decisions operative at a much higher level in the hierarchy.
3. A higher level unit is concerned with the slower aspects of the overall system's behavior. The lower levels of this decision tree are concerned with more particular local changes in the foreign policy process. The higher levels cannot respond to variations either in the environment or in the process itself which are faster than the variations of concern to the lower levels.
4. Descriptions and problems of higher levels are less structured with more uncertainties and more difficult to formalize quantitatively. Decision problems in the higher levels can be considered as more complex and an approximation can be used to derive a solution to a higher level problem, but accuracy is then reduced. One has to be cautious when interpreting the results.

In general, for any level there is a specific set of techniques suitable for the solution of respective forecasting needs. As we have laid out the system characteristics, units of the higher echelons are concerned with broader aspects of the foreign policy task and therefore have a more complex decision problem than those on the lower levels. They have a longer time frame with which to look at problems, and therefore are concerned with slower aspects of the overall foreign policy behavior. As we turn to specific instances of forecasting techniques and review their qualities we should keep in mind these characteristics so that we can decide at which stage and at which level in the process of foreign policy decision-making and planning forecast techniques are applicable.

The point that needs remphasizing at this stage is that at each of the nodes in Figure II decisions must be made which result in outputs. These decisions are made in part by information supplied about the current state of the process and by goals passed down in the form of interventions or decided upon at this level. But uncertainty exists at each stage and in the process of reaching decisions for action forecasts of the likely impact of these decisions must be made. In certain levels responsibility for dealing with uncertainty is limited to issues with low levels of complexity. This is especially the case at the process level. In issues of higher complexity, managers or senior political officers may be brought into the decision. It is not only the case that different individuals or levels in the hierarchy are involved at different levels of uncertainty but that different routines for handling uncertainty and information in forecasting must be employed. Several of these routines will be described below.

Consensus Forming Techniques

All levels of the bureaucracy attempt to make plans for future action. These plans are obviously based upon forecasts, often more subjective than scientific. It is, however, the case that the forecasts do tend to be of value in the delineating of a plan of action for a specific agency or in the case of the Presidential level for the whole foreign policy bureaucracy. As pointed out previously, the higher one moves in this hierarchy, the less susceptible to quantitative techniques are the questions that are being asked. This is true because they tend to be of a considerably broader nature, dealing with concepts and relations that are much more difficult to pinpoint. Consensus forming techniques for forecasting have been developed for just these types of problems. The techniques attempt to coordinate the joint estimates of experts on the likelihood of a technological development of a social or scientific event occurring in the future. Their major advantages stem from the fact that they use expert opinions under conditions of anonymity so that the social forces in a small group decision making process do not come into play. The most well known of these techniques is the Delphi method. It has generally been employed as a tool to facilitate planning and decision-making in both the hard sciences (Pyke, 1970; Ament, 1970; Enzer, 1971; Schmidt, 1971; Martino, 1972) and the soft sciences (Enzer, 1970; Knorr and Morgenstern, 1968; Helmer and Reascher, 1960). The technique was developed at the RAND Corporation. Their position is as follows:

> "Delphi is a technique of long-range forecasting originated by RAND Corporation senior scientists twenty years ago. In wide use today, Delphi can be applied to define corporate goals, develop a curriculum for higher education, or to predict scientific or technological

breakthroughs. It is done by marshalling the refined opinions of experts through successive interactions of a problem to prove individual answers. These in turn provide better group judgments." (RAND Corporation, 1971)

The Delphi technique employes a panel of experts who, acting without knowledge or identity of other participants, must decide when in the future, if ever, a specific event may be expected to occur. The Delphi experiment may be designed to do any of the following: (1) Specify a probable date or arrangement of dates for the occurrence of an event. (2) Indicate the probabilities and confidence levels associated with the projection. (3) Identify the impact that prior events in the future will have on the occurrence of latter events. (4) Additionally evaluate alternative futures in terms of their feasibility as well as their overall impact for outcome.

There are three basic steps in Delphi forecasting analysis. (1) Selecting an initial questionnaire. It is recommended that questions be selected such that rank ordering of options or the identification of a specific point in time can be provided. Questions which ask for values or opinions requiring paragraphs to develop are inappropriate for Delphi techniques. Thus, if one is developing a Delphi to rank order goals and priorities, one should ask questions about these goals either pairwise or require individuals to rank a set of goals. The initial list of events is usually considered as neither being final or exhausted. Experts may be encouraged to add other questions which they feel are important enough to warrant consideration by the panel.[12]

The use of experts in a Delphi panel is mandatory. One needs to deal with people familiar with trends, problems, capabilities and feasibility of specific events. The decision maker who employs Delphi techniques should feel that he is confident in the collective judgment of the experts he employs. It is quite

advantageous to use experts with differing ranges of expertise. Thus, men who are familiar with the technological aspects of an ABM decision might be combined with those familiar with the political impact of such decisions in order to attempt to assess the much more broad issues involved in ranking of U. S. objectives vis-a-vis ABM sites. One of the criticisms with the use of panels is that creativity and imagination are often stifled by group pressure. Junior men on the panel have a pronounced tendency to defer to their seniors, especially if there are implicit sanctions which are potentially administratable when the decision has been reached. The Delphi method attempts to solve these problems through the strategy of maintaining anonymity of the panel members and thereby eliminating the extraneous effects of reputation, personality and seniority of participants. Guaranteed anonymity is therefore a cardinal rule of the technique.

The actual exercise is conducted in a series of interactions. The first interaction commences when panel members have been presented with the questionnaire. They are asked to make their estimates or give their opinion and return the questionnaire. Once the questionnaires have been returned, the median or average response is recorded and the range of high and low scores is also delineated. In the second round, each participant in the panel receives the same questionnaire plus the information aggregated from the first round, the low, high and median responses on each question. He is asked to evaluate his own initial score in light of this information and to respond again. On this response, however, the individual is also asked to justify his position, if he feels that his answer deviates from the group median. The third commences with each panel member receiving the collected rationale for extreme positions, the median and the high and low scores from the second round and is asked once more to provide estimates for answers for each question. In each of these rounds other sets of

questions may be added to the questionnaire. For instance, each respondent may be asked to provide an estimate of his own reliability or the range of error in his estimate.

Such a technique could be used to identify events which are likely to occur by 1980 and the importance of these events on European security issues such as MBFR or CCD. In order to do this, the estimation of the initial likelihood of the occurrence of each event by 1980 would be needed. Estimation of the cross-impacts among these events is also important and potentially rewarding pieces of information. Decision makers might also want to identify those events where U. S. interaction could change the likelihood of the occurrence, and assess the desirable direction of such interventions. All of these questions could be asked in a Delphi technique and would provide long-ranged information for higher level decision makers.

There are a number of technical aspects which should be considered in implementing this technique but they will not be reviewed here. Those interested in pursuing the technique should consult Helmar (1966), Enzer (1970), or Martino (1972). The technique is particularly applicable where there are no formal methodologies available to provide direct predictions of some future occurrence. It is especially applicable to those complex sets of issues for which the analytical capability of the social sciences is not yet amenable. Shortcomings stem from unreplicability of results; the explicit reasons for a solution developed in a Delphi technique are not opened to experimentation and test. The type of role that Delphi can play in assisting foreign policy planning is associated with the tasks at higher levels of the bureaucracy. The time frame in which answers develop is any where from a day to several weeks, depending on whether all participants are assembled in one location. By its nature, the

technique is less applicable to the "what should we do next" questions of the working level bureaucrat but much more useful in the setting of priorities, considering the likelihood of events, and the impact of the events in the future. Delphi may also be quite appropriate in providing levels of concern for planning documents such as CASP Country Analysis. In this case each of the officers involved with the country may be asked to rank the levels of concern over three iterations.

Trend Extrapolation

Scientific methods based upon analytical models make possible a more objective approach to forecasting. One which can be explained to others and which can be analyzed and criticized by people other than the original forecaster. Roberts has outlined the history of economic forecastings as having passed through five stages, with the sixth stage on the horizon. These stages are:

1. Wisdom, expert or genius forecasting
2. Naive models
3. Simple correlational forecasting models
4. Complex integrated economic forecasts
5. Dynamic causally oriented models
6. The learning models (1969, p. 114)

Delphi techniques are a fine example of expert forecasting. Growth curve and trend extrapolating are naive forecasting techniques in that they do not provide information as to the causal elements or the manipulatable elements in any prediction. They are extremely useful in areas in which the forecaster can feel confident that the past line of behavior, cyclical or linear, will continue into the future. In many instances these techniques are short-range predicting techniques.[13] In some instances, however, where developments seem to take a

rather normal course of action in the same way they have been developing in the past, trend extrapolation can be useful for longer range predictions. The simplest of these techniques is the straight-line projection. Figure IV presents an example of this form of projection. It shows the estimate of top speed of United States combat aircraft as it has grown since 1910. A linear regression line, least squares, fits this data extremely well. The regression of speed and miles per hour on time is:

$$Y = -18.30568 + .06404\ T$$

The correlational coefficient is .98580 and the standard error of the regression coefficient is .00193. Barring drastic breakthroughs in flight propulsion, extrapolations into the future can be based on this same equation. There are dangers, however, in proceding in this manner. See for instance, Figure V on the gorwth of kill power in waspons sytems over time. Such inventions as the atomic bomb have seriously thrown the normal simple linear model off considerably.

Slightly more sophisticated techniques are based upon cyclical assumptions. Business curves frequently rely upon seasonal oscillations in the economy as well as many specific non-seasonal but occupational oscillations. These techniques have proven beneficial in forecasting economic impacts of various tariff positions on U. S. industry. One particularly interesting account stems from a disagreement with the Japanese tile industry over their production of building tiles for ceramic tile bathrooms. Economic analysts in the State Department confirmed Japanese claims that the Japanese and U. S. oscillations in production were prefectly out of phase such that Japanese supplies hit U. S. markets when U. S. manufacturers could not supply the demand. Indeed continued use of Japanese tile increased their demand without affecting U. S. manufacturers' markets, thereby making the free import of Japanese tile a positive benefit.[14]

The systems analysis group in the office of Secretary of the Defense has used several trend analyses in looking at the Vietnam war. These analyses have proven beneficial for short-run predictions of supplies from the North and likely shifts in the current level of activities in specific areas. Charles McClelland at the University of Southern California has been experimenting with various cyclic descriptions of the foreign policy exchanges between a number of key nations in the world. While these methods are widely used, and extremely useful, it must be recognized that they have the following serious shortcomings:

1. They are unable to give warning that there has been a significant shift in the conditions which produce the past behavior. Predictions from the past could be extremely inaccurate.
2. They are unable to predict the outcome even when it is known that one or more possibly important conditions are going to be changed in the future. This is true even when that change is recognized to be likely to produce an alteration in the rate of advancement.
3. They are unable to give policy guidance as to what conditions should be changed or manipulated and by how much, to produce a desired change in the rate of growth or decay in whatever trend is being predicted.

We cannot dismiss, however, those who accept or advocate trend analysis so easily because of the time constraints on the decision process. Martin Schubek asserts:

> "There are the chartists and the fundamentalists. The fundamentalists want to discover as much as they can about the firm--where its technology is going and so forth--while the chartists draw some linear extrapolations of what is going on and invent such phrases as 'when the thing has heads and shoulders.' You cannot idly dismiss the chartists, because in one sense, a key to forecasting is the amount of time one has available in the decision process to make a statement about the future. A chartist can

> come up with some sort of fairy tale in ten or fifteen minutes. If you do not have more time, pherhaps that is the best you can get." (In Bell, 1964, p. 945)

Given constraints on foreign policy decision-making where time is of the essence, looking at the trends and visually, unmathematically extrapolating the likely events in the future if things go unchecked might be an excellent first approximation to developing early warning systems. McClelland has argued that we can identify the growth of crises this way by watching the communication between hostile nations overtime and he has also demonstrated that shifts in the pattern of interaction do signal changes in strategy. (1961) These short-range forecasts of imminent change in system performance seem to be potentially advantageous to working levels in the bureaucracy where time is of the essence and actions are broken down to their smallest unit of analysis.

Correlational Forecasting Models

Where more time is available, however, other techniques may be more beneficial. The fundamentalists, as Schubick calls them, believe that at least some of a number of potential variables exhibit interdependencies in general which are sufficiently important that they must be taken into account in making any prediction. From a policy standpoint, regression and correlational techniques allow the identification of independent variables which are potentially usable as actions that one country, in this case the United States, could employ to increase or decrease a dependent variable which in this case would be some observable performance measure associated with a national interest. Analysts can attempt to account for variance in one specific variable by applying correlational or regressional techniques to a set of variables at a cross-section in time or over time.[15]

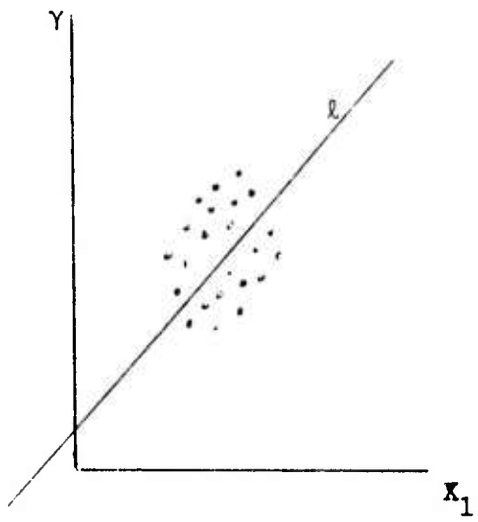
In scientific research, we work with what are called independent and dependent variables, the former being the "causes" of a given social phenomenon and the dependent variables being the phenomena "caused." (Caused here is not used in any strict sense; at times we have only a notion that one variable is related and prior to another phenomenon.)

The regression model is an attempt to predict with maximum efficiency, the value of a dependent variable from one or more independent variables. In rough mathematical notation, this may be expressed:

$$\gamma = \alpha_1 + \beta_1 X_1 + \beta_2 X_2 + \ldots \beta_n X_n,$$

where $\gamma$ stands for the dependent variable and X's for independent variables. The specific relationship between the independent and dependent variables is designated by the $\alpha$ values in the above equation. Each $\alpha$ weights the independent with which it is associated according to the impact which that independent variable has on the dependent variable. These $\beta$ values are frequently designated either as b or $\beta$ and are called regression coefficients or beta weights.

Assume for the moment that we have one independent and one dependent variable. Then the cases which we are studying can be plotted graphically, for example:




the goal of linear regression in this case is to draw some line through these points in such a way as to maximize the efficiency of our predicting $\gamma$ from $X_1$. Though this line may be a curve, assume that it is the straight line $\ell$ drawn in the diagram. Our prediction of $\gamma$ values in this case is most efficient if $\ell$, the sum of the distances from each point to the $\ell$ is a minimum value.

Once such a line is determined, there are at least three different questions we may ask: (1) What is the impact of $X_1$ on $\gamma$ ? In other words, how much of a change in $\gamma$ is initiated by a one unit change in X? The answer to this is given by the regression coefficients mentioned above. In the chart our regression coefficient will be positive--an increase in X is associated with an increase in $\gamma$ . (2) How well can we estimate $\gamma$ values using $X_1$ values and our regression line $\ell$ ? This question is given to us in summing the squared deviations of the points from the line and dividing that number by the number of cases. In other words, we calculate the average squared error with which we estimate $\gamma$ . This number is called the standard error at estimate. (3) What percentage of the variation in $\gamma$ values can be accounted for by our independent variable X? This last question brings us into the related question of correlation. If we wish to know the correlation between X and $\gamma$ , we are finding the degree to which high values of X occur with high values of $\gamma$ and to which low X values occur with low $\gamma$ values. One coefficient for determining this degree of covariation is the Pearson product moment correlation. If the correlation = 1.0, X and $\gamma$ values are completely covariant; if it is = 0.0, the $\gamma$ values are randomly dispersed without regard to X values. Further, when this correlation is squared, it indicates how well X accounts for the variance in $\gamma$ .

Suppose we were interested in finding out the impact of U. S. aid upon the stability and development of a particular country, perhaps Brazil. We could regress variables for development or political stability upon various types of U. S. economic and military assistance to Brazil over time. The multiple regression correlation would tell us what percentage of the variation in stability or development was associated with U. S. economic aid. The regression coefficients would specify which type of aid had the largest impact upon stability and development. Unexplained variation, $1-r^2$ would be attributable to other factors, perhaps even observational area.

The most important consideration in applying regression techniques is that the independent variables be selected because they are manipulable by U. S. policy processes. In forecasting for planning, the relative importance of a variable should be considered both from the technical, statistical standpoint of a strong regression coefficient and from the policy standpoint of being a variable which the U. S. can actually manipulate. Thus, variables such as world public opinion, number of nations in an alliance, economic development or political stability may be only slightly manipulatable by the United States. On the other hand, there are other variables such as the various types of aid and diplomatic recognition, all variables which the United States can more easily choose to employ. Regression coefficients are properly used to estimate population parameters only when the structure of a model employed in forecasting is well specified. Brunner (1970) demonstrated very convincingly that the data and strategies presently employed by most political scientists (such as regression analysis) will usually not reveal the underlying structure of a model. This is generally the case whether the systems are analyzed cross-nationally at a point in time or individually as a time series.

While regression techniques are not applicable where the questions addressed, attempt to describe all or a significant aspect of the future, they are quite appropriate when one is designating a well-sepcified problem in which the components are easily identified. When the analyst wants to know the consequences of changing U. S. commitments or actions on a specific host country and he is reasonably sure that he has specified all relevant variables, regression techniques can be employed. Their advantage over trend techniques is that they do identify causal elements which can be manipulated. Such problems as those addressed by the inter-agency committees whose task is to coordinate military and economy

assistance may benefit from regression analyses to identify expected impacts of various assistance programs. The questions of the impact of arms transfers might also be amenable to such regression techniques. The forecasts in these cases form background information for identifying expected performances of national systems when aid or arms transfers are contemplated. These expected performances can be compared with goals and interests on a country-by-country basis to identify or rank various strategies vis-a-vis a particular country.

Dynamic Causally Oriented Models[16]

Most attempts to generate an explicit model of foreign policy behavior, on the part of academics, have relied upon linear relations among relatively few variables (e.g., linear regression models and factor analysis). These models have advantages over mental images of foreign policy interactions since they have specified sets of assumptions about the relations between these variables which can be checked by resorting to data analyses. These assumptions of linearity provide fairly accurate short-term (several years) projections since any curve, over a short enough interval, can be approximated by a straight line. However, the longer into the future the projections are made, the greater will be the likely error, just as in the case for trend extrapolation. In designing long-term planning systems, the analyst must be prepared to work with non-linear systems. One problem with non-linear systems is the lack of methods for solving such systems analytically. However, solutions can be reached through the use of computer simulations. These simulations provide information about the overtime implications of the defined alternatives. Moreover, they will allow the manipulation of the variables and relations to test the relative, long-range impacts of various policy alternatives. These simulation models require that the

variables be categorized as to whether they are manipulatable or non-manipulatable and as to whether they are exdogenous or indogenous;

1. Manipulatable Variables are directly controllable by U. S. government.
2. Non-manipulatable Variables may vary by functions by other variables in the models but are not directly controlled by U. S. actions.
3. Exogenous Variables effect but are not affected directly by relations specified in the system.
4. Indogenous Variables affect other variables and are in turn affected by other variables in the system.

A set of variables representing each subset of manipulatable exogenous, non-manipulatable indogenous, and non-manipulatable exogenous variables can be identified. Manipulatable indogenous variables are illogical from a standpoint of policy planning. The design variables should be ordered by a set of relations which would, in part, be identified by long-range planners and could be used to construct such simulation based upon data currently available. These relationships would be an explicit attempt to formalize the mental images used by policy makers in currently making decisions on what U. S. courses of actions should be based upon and expectations of the effect of these courses of action.

Thus, within the system, each variable would be in one of the following vectors:

$M^x_i$ = vector of manipulatable exogenous variables

$U^n_i$ = vector of non-manipulatable endogenous variables

$U^x_i$ = vector of non-manipulatable exogenous variables.

These variables are related by some set of relations, f. Thus:

$$f(M^x_i, U^n_i, U^x_i) = \text{"The System"}$$

An example might be helpful both in illustrating the vocabulary just developed and in introducing several important concerns which differentiate this project from previous efforts.

Imagine a policy planner who is very interested in what makes people in a nation "satisfied" or politically stable. After doing some preliminary discussion, the following three variables are decided upon as being the important concerns:

$S_t$ = overall satisfaction level of the people in a given nation at time t

$E_t$ = performance of the economic sector of the nation at time t

$G_t$ = performance of the government of the nation at time t

In addition to the identification of important variables you must define a set of relationships between these variables: a structure of the system must be given. Our political analysis stipulates the system structure with the following equations:

1. $E_t = \alpha S_{t-1}$
2. $G_t = \beta (E_t - E_{t-1})$
3. $S_t = G_t + E_t$ where $\alpha$ and $\beta \geq 0$

Equation 1 states that economic sector performance will be proportional to the preceding period's level of overall satisfaction. Equation 2 tells us that government performance will be proportional to the change in economic sector performance from this period to the preceding period. Finally, 3 is an accounting equation which defines overall satisfaction as the sum of government performance and economic sector performance. (Throughout this discussion it will be assumed that S, E, and G are measured in comparable units.)

The endogenous non-manipulatable variables of the system are G, E and S and the state of the system at a particular point in time is therefore given by

listing values of each variable at that time: $G_t$, $E_t$, $S_t$. Variables which are not included in the system are called parameters. An "effective" parameter is one which has a discernible impact upon the system's behavior (e.g. $\alpha$ , $\beta$ , and t in the set of equations above). The above set of equations describes a dynamic system since the system is effectively parameterized by time.

The values of $\alpha$ and $\beta$ for a particular nation might be estimated by observing the overtime values of S, E, and G. As Brunner points out, the data analysis problems associated with this estimation are by no means simple. However, let us assume an awareness of the problems, from tasks I and II; then from data for the period 1966-71 we estimate $\alpha = 0.5$ and $\beta = 0.0$. We can now use equations 1-3 together with these estimates of $\alpha$ and $\beta$ to make the following predictions about future system behavior:

Table 1

Results of Equations 1-3 When $\alpha = 0.5$ and $\beta = 0.0$

| | $\alpha$ = 0.500 | $\beta$ = 0.000 | |
|---|---|---|---|
| | T | S(T) | E(T) | G(T) |
| Already Observed | 1966 | 1.000 | 0.000 | 0.000 |
| | 1967 | 0.500 | 0.500 | 0.000 |
| | 1968 | 0.250 | 0.250 | 0.000 |
| | 1969 | 0.125 | 0.125 | 0.000 |
| | 1970 | 0.062 | 0.062 | 0.000 |
| | 1971 | 0.031 | 0.031 | 0.000 |
| Predicted | 1972 | 0.016 | 0.016 | 0.000 |
| | 1973 | 0.008 | 0.008 | 0.000 |
| | 1974 | 0.004 | 0.004 | 0.000 |
| | 1975 | 0.002 | 0.002 | 0.000 |
| | 1976 | 0.001 | 0.001 | 0.000 |
| | 1977 | 0.000 | 0.000 | 0.000 |
| | 1978 | 0.000 | 0.000 | 0.000 |

Since the consequences of having satisfaction or stability, $S(t) = 0$ are usually thought to be undesirable, the results reflected in Table 1 may be viewed with alarm. Accordingly, the question becomes what policy advice can be given. This in turn rests upon assumptions about the relationship between actions open to the U. S. with respect to this particular country (the manipulatable exogenous variables) as well as assumptions about other nations' attempts to influence outcomes in that country (non-manipulatable exogenous variables).

Suppose that we know that $\alpha$ is a function of U. S. technical assistance in terms of mass communications programs and that $\beta$ is a function of heavy industrial capital. This knowledge enables us to specify an activity which would increase the values of $\alpha$ to 0.8 and $\beta$ to 3.0. Then for the value of $S(t)$ set at 1.0 for one time period, our original equations predict that the people's satisfaction will rise in the quasigeometric fashion traced in Table 2.

Table 2

$\alpha = 0.800$ $\beta = 3.000$

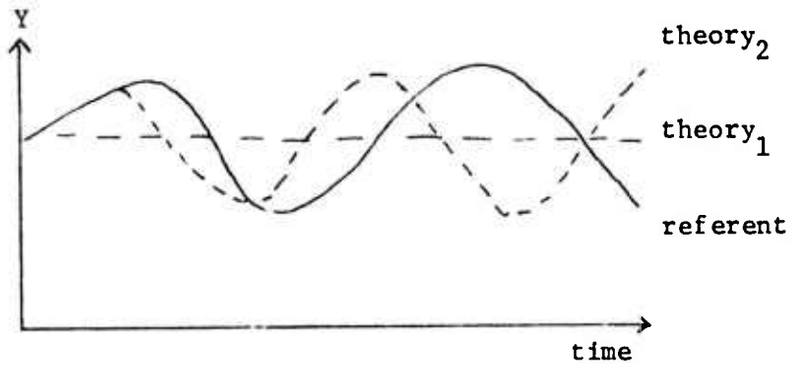
| T | S(T) | E(T) | G(T) |
|---|---|---|---|
| 1 | 1.000 | 0.000 | 0.000 |
| 2 | 3.200 | 0.800 | 2.400 |
| 3 | 7.840 | 2.560 | 5.280 |
| 4 | 17.408 | 6.272 | 11.136 |
| 5 | 36.890 | 13.926 | 22.963 |
| 6 | 76.267 | 29.512 | 46.756 |
| 7 | 155.521 | 61.014 | 94.507 |
| 8 | 314.625 | 124.417 | 190.208 |
| 9 | 633.549 | 251.700 | 381.879 |

Table 2 assumes no change in the non-manipulatable exogenous variables for simplicity. But the impact of a policy upon one nation must be weighted against its impact on U. S. objectives in other countries as well. To state an obvious point, finances and national security place limits upon both the quality and quantity of foreign involvement. Since this is the case, optimization on a

country-by-country basis will generally yield greatly sub-optimal global results. For example, U. S. policy toward Brazil maybe an exogenous variable affecting Chile's relations with the United States. These other country impacts must also be taken into account in long-range planning.

The role of forecasts and their accuracy in the policy planning process introduces some difficult questions in terms of the definition of accuracy. Accuracy has at least two meanings. Theories should not be evaluated and compared exclusively on the accuracy of their point-in-time predictions. It is neither a necessary nor sufficient condition for a theory well-suited to yielding policy advice. For the purposes of making policy recommendations, we might prefer a theory which makes point-in-time predictions which are less accurate than those made by another theory.

Consider the following example drawn from Forrester's Industrial Dynamics (1970) as seen in Figure VI.




Suppose we somehow know (perhaps we are told by a genie) how an important variable in the referent behaves over time. This behavior is represented by the solid line in Figure VI. There are two "competing" systems (or alternative theories about two structurally different systems) which purport to relate the variable with time. The "predictions" of these two theories are illustrated in Figure VI by

dotted lines; theory$_1$ by a horizontal straight line and theory$_2$ by a slowly growing sinusoid which has a period of fluctuation about 25% shorter than that of the referent.

Which is the better theory? The answer clearly depends upon the theorist's objective. If the purpose of the theory is to predict values of the variable at closely spaced points in time in such a way as to minimize the sum of the squared deviations between predicted and observed values, then we would prefer the straight line predictions of theory$_1$.

However, if our objective was to predict how changes in the system would affect the system's output, we should be very reluctant to employ theory$_1$. Although theory$_2$ yields point-in-time predictions which are inferior to those of theory$_1$, it better reflects the dynamic character of its referent and therefore appears to be a better guide to "desirable time points at which to introduce policy changes.

In short-range prediction, minimizing random events and error in point prediction may be a beneficial goal in planning, but it is not decisive to argue that random events will destroy the accuracy of long-range predictions or that one could not predict 1970, for example, from what we know about 1930. This is not decisive because the aim of such efforts is not a precise blueprint of the real future, rather the provision of some grounds by which we can make present planning choices more sensibly. These choices may themselves undermine the accuracy of any prediction, but that is not nearly as significant as the fact that predictions are absolutely necessary if we are to be able to take account of the long-run and what we do now. Joseph Martino argues the point well:

> "This view of the measure of goodness of forecasts must be accepted by both decision maker and forecaster. If the decision maker insists on

judging forecasts on the basis of whether or not they come true, he may find himself in trouble. Some poor forecasters in view of the self-fulfilling and self-defeating paradoxes have advocated what amounts to protective action. They advocate that the forecaster take into account people's probable reactions to the forecast, and then state the forecast in such a way that it will seem to have been correct. The end result of such a procedure would be to make forecasts completely useless for decision-making. They would become like those of the Delphic oracle, which have been described as vague and ambiguous, allowing room for different interpretations. Or worse, they might become like those of Al Cap's character, Old Man Moose, whose forecasts are so confusing that they can't be understood until it's too late. A forecaster would be proven right by events, but his forecasts would be of no benefit to anyone. Thus, the decision maker who wants to continue to receive competent, professional advice from his forecasters must judge the goodness of that advice in terms of its utility for decision-making, not in terms of whether the forecast eventually comes out true. Likewise, forecasters must recognize that his objective is to be useful, even if this means being wrong." (1972, p. 13)

In interviews with the Arms Control and Disarmament Agency a sage systems analyst charged with the task of forecasting likely outcomes of various arms control measures both in SALT negotiations and in upcoming MBFR negotiations commented that perhaps the most important point to keep in mind was that the forecaster works for a client. Answers to questions for his client, drive all of the forecasting that he contemplates. Forecasts performed in a vacuum, while perhaps interesting, are usually worthless. These comments emphasize the role

of utility in estimating the value of any specific forecasts. While the criteria of utility is certainly the final arbitor on the use of a specific technique, let us attempt to categorize the forecasting continuum into several arbitrary levels so that we can make suggestions as to the potential application of the various techniques reviewed in this chapter. For the sake of simplicity consider four problems which divide the continuum of forecasting:

A: What Effort

B: What Success

C: What Can We Do

D: What Are the Future Implications

In Problem A, What Effort, the question to be answered by the forecaster is: which of an infinite number of unknowns could be addressed with current resources: Which of these would likely have the greatest payoff? This problem is one of the most difficult to resolve. It requires the strongest concentration of experts and wisdom judgment. It is the area in which consensus-forming techniques, as the Delphi, are likely to be their largest success.

In Problem B, What Success, we are typically concerned with describing the state of the art. The problems typically encountered in forecasting in this area are questions: in which particular areas of a problem can changes be expected to occur. In this area a mix of three types of forecasting seems potentially relevant. Certainly consensus-forming techniques are still quite applicable. Trend analysis may demonstrate that recent shifts indicate drastic changes in activity or development. And regression models may specify which variables to manipulate in order to achieve greatest success.

In Problem C, What Can We Do, we are concerned with applications. The systems of interest are not necessarily physical systems such as ABM's. They

include political, economic and social systems as well. It is here that the forecaster must bring together relatively independent streams of events and envision a possible merging of interactions to achieve some end. It should be apparent that forecasts prepared on Problem C, What Systems, require models which are in order of magnitude greater in the number of concepts and relations than those required in A or B or are of a unique caliber. It is thus essential that highly specified regression techniques be used or non-linear systems and simulations be relied upon for forecasts.

The final problem area, What Are the Future Implications, is effectively inclusive of all others but is also unique. These are the problems where one attempts to describe all or a significant aspect of the world of the future. That is ten or more years away. Of particular interest in this area is the unanticipated consequences of decisions. Therefore, we really have to deal with Problem D in resolving the combined impact of other problem projections in a long-range period.

In Problem D the resolving of the combined impact of other problem projections in the long-range period, means several things. First, anyone or any part of the problems in A, B, or C, is reduced in visibility and relative significance in this problem area. Second, the descriptions of the future are likely to be more qualitative in nature. And third, the reliance on point predictions and event predictions is significantly reduced. The requirement becomes one for generalizations as opposed to specifics. It is for this problem that the technique of complex non-linear feedback approaches have been developed and are most likely to have greatest payoffs.

Conclusion

This chapter has attempted to delineate a formal specification for the decision-making process in foreign policy bureaucracies and to use that delineation for the discussion of the role of forecasting and policy planning for foreign affairs. The strategy employed was to delineate the types of decision processes that occur at various levels in the decision process and to specify the planning that was essential in each level of the decision process. Specification of planning then led to the requirements for each planning activity in the way of forecasting information. Against this set of requirements the various forecasting strategies available were reviewed and through the technique of specifying decision problem types, suggestions were made as to the applicability of a set of alternative techniques.

It is no secret that attempts to formalize the decision process, especially in the area of policy planning and forecasting for planning, is not viewed without alarm by policy planners. By way of defense, let me conclude this chapter by pointing out the most compelling reasons for accepting the point of view put forth here.

Halprin (1973) has pointed out that the planning status of various agencies in Washington vary, in terms of their capabilities, in direct relationship to the amount of resources that the agency in which the planning is being done is responsible for. If this is the case, those who have the largest slice of the pie, the military, would be expected to have the most sophisticated planning status. Halprin is obviously correct in this respect. It can also be pointed out that forecasting for planning in the military is essential since budgetary cycles and research and development costs require relatively long-range commitments to weapon systems. Thus it takes five to ten years of developmental costs for a

weapon system to be fully operational. This raises the question as to whether it is advantageous for the military to have the best policy planning staffs. The question verges on an ethical point on which several pages could be devoted. It is not the ethical question, however, that I wish to address. Rather, it is the implication for inter-agency disagreements that such a differential in planning must entail.

The hierarchical control system model presented in this chapter emphasizes the need for coordination at high levels in the policy bureaucracy, if actions on the part of multiple decision units are to be integrated. Thus, when managerial level concerns are contradictory between agencies, information must travel up the system to the NSC or other offices at higher levels in the bureaucracy. Unfortunately, the decision strategy employed by the agencies in this game is that akin to a poker player. Each hand is played to be won. An ABM question is fought out and won or lost; the B-1 bomber is approached in the next hand.

The implications of this chapter are that a chess strategy is much more likely to succeed. In other words, certain arguments are worth losing to protect more central or intrinsic goals. The development of chess strategy requires that longer range planning be instigated. Halprin's point is that long-range planning is well developed where agencies are responsible for large resources. Thus, not only are these agencies pursuing chess strategies, they are essentially not defeatable by a poker strategy in the long run.

The point may not be made only with regard to inter-agency concerns, however. It seems obvious that the strategies of a good chess player are required in dealing with other nations. Poker is not a good model for the long-range problems that face foreign policy decision-makers. In responding to the policy actions of other nations simple algorithms can be used by working level diplomats which may,

over the short run, appear to be poker strategies. It is essential, however, that managerial level and supreme control units instigate strategies akin to those of a chess player. As these strategies of coordination, in terms of our foreign policy effort, become well recognized, forecasting will tend to be taken more seriously in the planning efforts. Not only will forecasting be employed more frequently for planning, but the range of the forecasts ought to increase as the importance between plans and actions increases and as the process moves up the hierarchy in the decision process.

The implementation of these tasks is not considered a panacea by any means. Nor is it expected that the speed with which techniques similar to those delineated here will be adapted, with anything approaching the speed of light. Others have discussed the difficulties and possible approaches in applying academic skills to policy decision-making.[17] The optimum solution is not in sight. It may seem an evasion to paraphrase Mao Tse Tung and assert that the only way to learn about forecasting is by making forecasts, but this rightly understood, is the heart of the matter. Such developments as a Joint Long Range Strategic Study and the CASP country analysis papers point the directions. The future is inevitable.

FOOTNOTES FOR FORECASTING FOR POLICY

1. The types of planning discussed here were suggested,by Puckett,1972. For review and critique of Puckett's position see Hilliker (1972).

2. For an extensive review of the CASP and PARA system see Bendix research reports on PARAS.

3. Reviews of forecasting efforts include Bendix, 1972, Tanter, 1970, and Geiger and Hansen,(1968)

4. This position is well developed in Forrester, 1971.

5. Axelrod (1973) surveyed bureaucratic decision making officials responsible for military assistance programs and found that forecasting is a routine operation. He also found definite organizational biases.

6. See Tanter and Ulman, 1972, Bobrow, 1972, Choucri and Robinson, 1973, Rummel, 1970, and Hermann, 1972.

7. This point is supported by Geiger and Hansen, 1968, Axelrod, 1973, and Forrester, 1971.

8. Users have demonstrated an interest in more effective employment of academics. The Military Operations Research Seminars have faced the problem in the forecasting for planning workshops, the Advanced Research Projects Agency has supported and is continuing to support conferences to bring users and academics together. Various models for this intergration can be found in Havelock 1971 and 1972.

9. The Arms Control and Disarmament Agency, the State Department, and The Advanced Research Projects Agency of the Defense Department are all supporting contracts which would attempt to identify areas of utility from the research community for their needs.

10. The classification of foreign policy actors relies upon Stemple's (inden) suggested typology. A slight modification of this typology is developed here.

11. The development of this application of control theory stems from the work of Mesarovic et. al. 1970. For other suggestions of similar approaches see Steinbrunner (1973) and Burgess (1972).

12. An excellent and simplified introduction to the potentials of the Delphi technique can be found in Benson 1972.

13. For a review of the advantages and disadvantages of these techniques see Young, 1970. For a fine discussion of the methodologies involved see Martino, 1972.

14. This example comes from personal discussions at the Foreign Service Institute Course in Quantitative Approaches to Foreign Policy.

15. For a view of the techniques involved see Ezekiel and Fox (1959) and Draper and Smith (1966).

16. The next five pages are adapted from Phillips and Thorson; Research Proposal to the Advanced Research Projects Agency.

17. See Hermann, 1972, Stemple, indem, and Bobrow, 1971.

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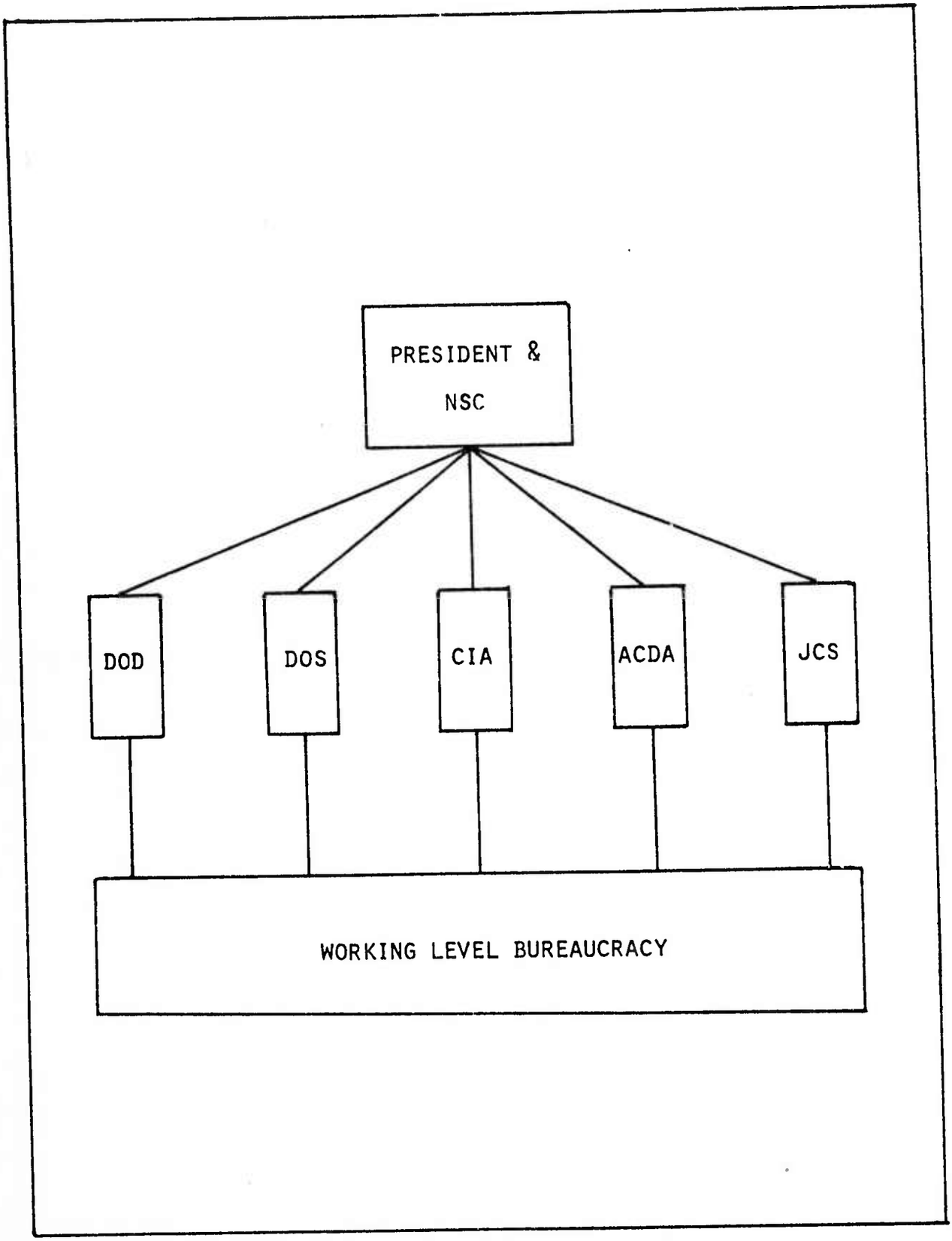


FIGURE I - THE FOREIGN POLICY DECISION-MAKING HIERARCHY

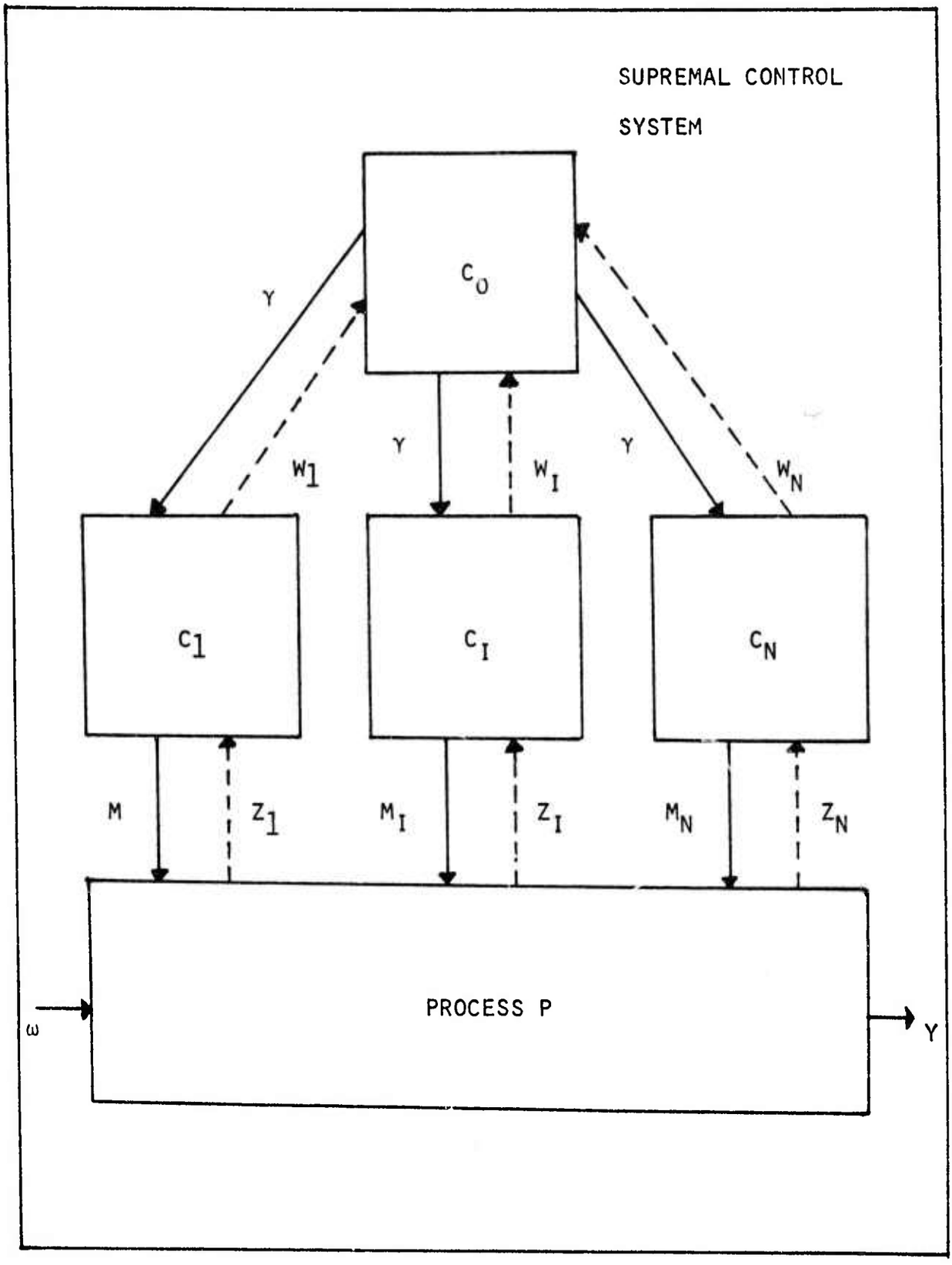


FIGURE II - A TWO-LEVEL SYSTEM WITH N INFIMAL CONTROL SYSTEMS AND A SINGLE SUPREMAL CONTROL SYSTEM*

*TAKEN FROM MESAROVIC, ET AL., 1971, P. 86.

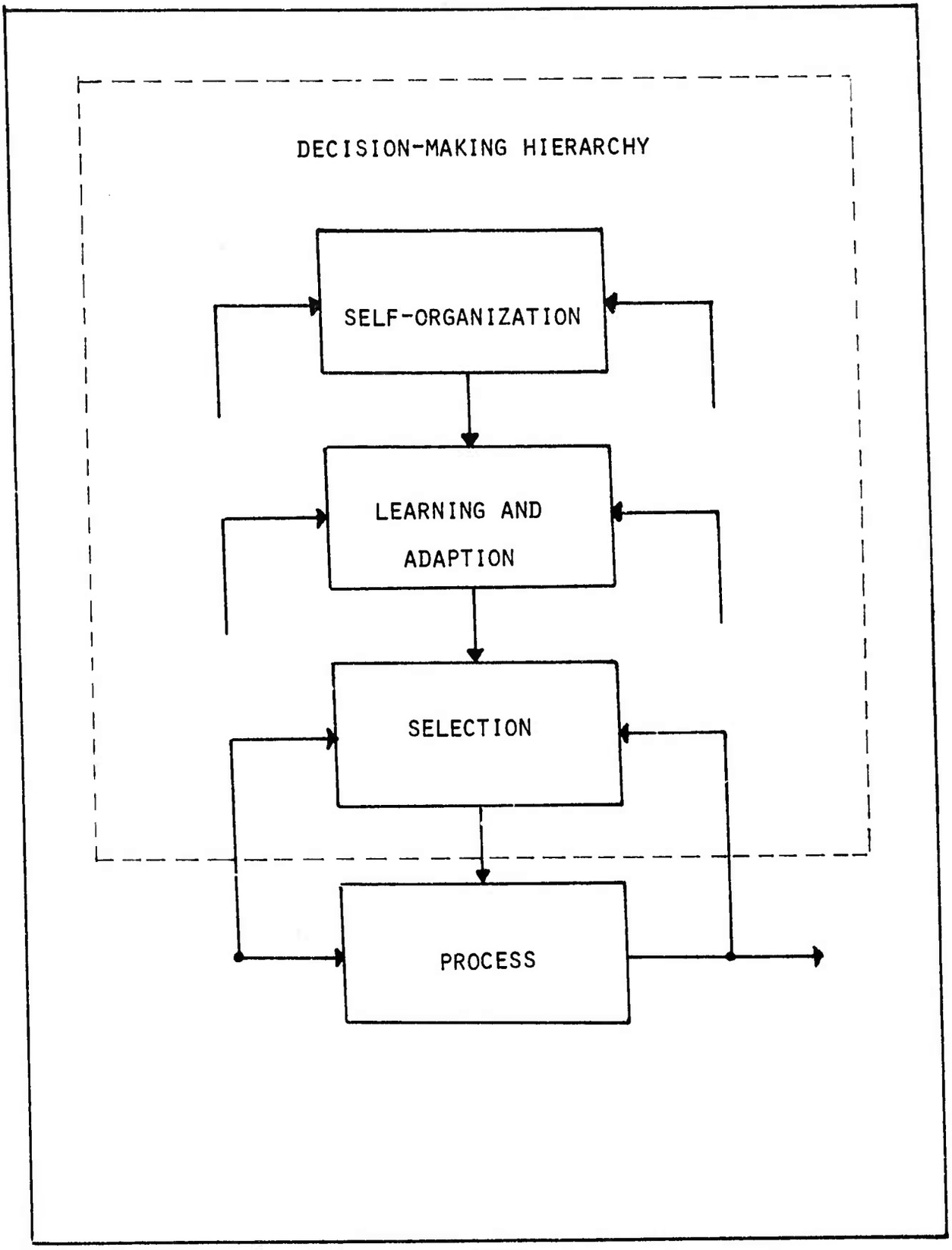


FIGURE III - FUNCTIONAL MULTILAYER DECISION HIERARCHY*

*TAKEN FROM MESAROVIC, ET AL., 1971, P. 47

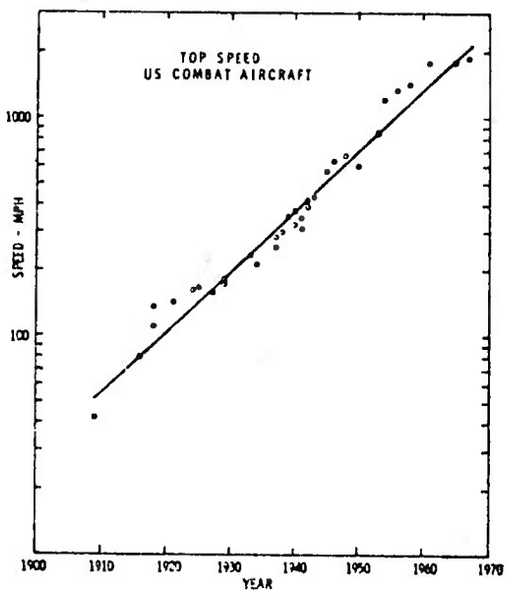


FIGURE IV - TOP SPEED OF U. S. COMBAT AIRCRAFT*

*TAKEN FROM MARTINO, 1972, P. 135.

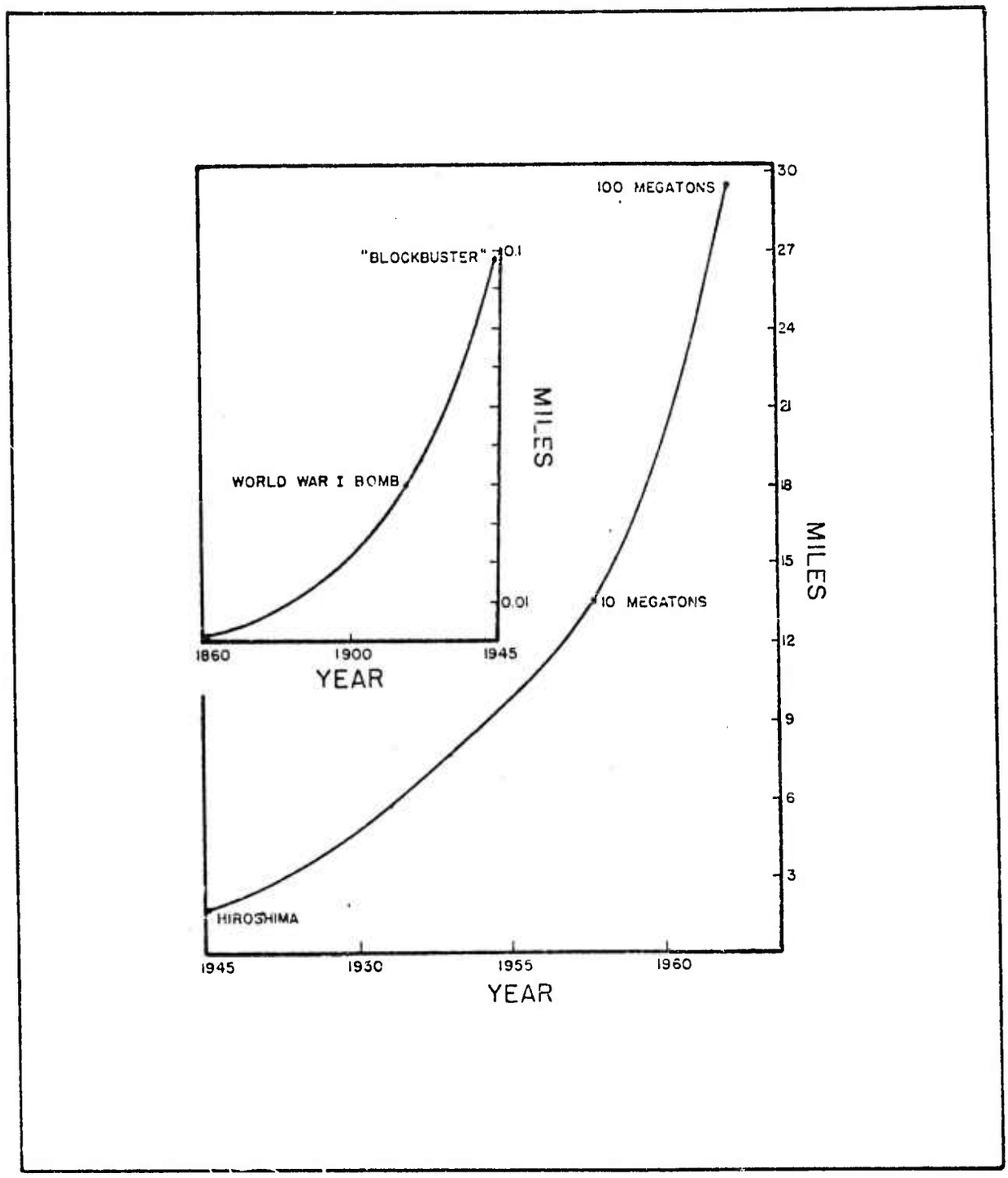


FIGURE V - MORE BANG FOR A BOMB: MAXIMUM DESTRUCTIVE RADIUS OF EXISTING WEAPONS, 1860-1960. (Calculated from U. S. Atomic Energy Commission, The Effects of Nuclear Weapons (Washington, 1962). Destructive radius defined as sufficient blast overpressure (3 pounds per square inch) to collapse an ordinary frame house.)*

*Taken from Russett, Trends in World Politics, 1968, p. 10.

| | WHAT EFFORT? | WHAT SUCCESS? | WHAT ACTION? | FUTURE IMPLICATION? |
|---|---|---|---|---|
| PRESIDENT | H | L | L | H |
| SENIOR POLITICAL | M | H | H | H |
| WORKING LEVEL | L | M | H | L |

FIGURE VI - APPLICABILITY OF FORECASTING PROBLEMS TO BUREAUCRATIC LEVELS

| | WHAT EFFORT? | WHAT SUCCESS? | WHAT ACTION? | FUTURE IMPLICATION? |
|---|---|---|---|---|
| CONSENSUS TECHNIQUES | H | H | L | L |
| TREND EXTRAPOLATION | L | H | L | L |
| CORRELATIONAL FORECASTING | L | H | H | M |
| DYNAMIC CASUAL MODELS | L | M | H | H |

FIGURE VII - APPLICABILITY OF FORECASTING TECHNIQUES TO FORECASTING PROBLEMS